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MARSHALL PROCEDURES AND GUIDELINES

SD01

CONDUCT OF RESEARCH AND TECHNOLOGY ACTIVITIES

DOCUMENT HISTORY LOG

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PREFACE

P.1 PURPOSE

This procedure defines the minimum requirements and guidelines for conduct of scientific and engineering research at Marshall Space Flight Center (MSFC). Implementation of this procedure will satisfy the requirements of the “Marshall Management Manual” (MMM), MPD 1280.1.

P.2 APPLICABILITY

This procedure applies to all scientific and engineering research activities performed at MSFC that are started after the date this procedure is put into effect.

P.3 AUTHORITY

MPD 1280.1, “Marshall Management Manual”

P.4 APPLICABLE DOCUMENTS

a. MPD 1280.1, “Marshall Management Manual”

b. MPG 1440.2, “MSFC Records Management Program”

c. NPG 1441.1, “NASA Records Retention Schedules”

d. MPG 7100.1, “New Work Acquisition and Proposal Development Process”

e. MPG 8730.5, “Control of Inspection, Measuring, and Test Equipment”

P.5 REFERENCES

None

P.6 CANCELLATION

None

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DOCUMENT CONTENT

1. DEFINITIONS

1.1 Authority to Proceed (ATP). An ATP is a document or set of documents that provides authority to proceed with a research activity. The ATP identifies or defines as a minimum:

1.1.1 The customer;

1.1.2 The Principal Investigator and other lead activity personnel;

1.1.3 The name of the research activity to be performed;

1.1.4 Level of resources (including funding source and valid cost code);

1.1.5 The initiation date;

1.1.6 A timeframe to perform the activity; and

1.1.7 An authoritative signature to commit MSFC funds and resources.

The ATP normally includes the selection letter and can be a memorandum, electronic mail printout, or any other form that meets the intent of this paragraph.

1.2 Customer. The customer is the end user of the output or product produced by a research activity. The customer is responsible for reviewing and selecting or rejecting the research proposal. The customer provides the ATP that initiates the activity.

1.3 Primary Research Record. A primary research record contains primary scientific or engineering data pertaining to the research being done. It can be in any form, including a lab notebook, a journal, computer files, experimental data files, etc. It is a record that can be used to trace the line of research and results. It would be a primary document validating a patent claim.

1.4 Principal Investigator. The Principal Investigator (PI) is the person responsible for the management and technical (scientific or engineering) integrity of the output of a research activity.

1.5 Product. The product is the final output of any research activity that satisfies a customer's requirements, including concepts, analyses, designs, or hardware produced from those designs, specifications, or hardware procured from those specifications, sketches, reports or published articles, inventions, procedures, software, etc.

1.6 Proposal. The proposal is the document that details the research activity proposed in response to a customer request. The document includes specific details of the research activity as well as the resources required to perform the research. The proposal must include appropriate executive commitment by the originating organization in support of the PI.

Proposals (both solicited and unsolicited) are generated, reviewed, and approved prior to submission according to the requirements of MPG 7100.1, “New Work Acquisition and Proposal Development Process.”

1.7 Research Activity. A research activity is an organized effort by appropriately trained personnel to generate new knowledge. These activities include scientific and engineering research and technology development tasks, including (but not limited to) tasks specified in: the Research and Technology Objectives and Plans (RTOP); the Center Director's Discretionary Fund (CDDF) Program; and Advanced Technology Development.

For purposes of this document, research activities are defined as efforts not specifically designated by a program and not requiring a project manager, systems engineer, or project scientist. Research activities are covered by this document.

A research activity is under the lead of a PI and could have no specified output except a report, research computer code, or a scientific publication.

1.8 Research Plan. The research plan defines the research activities to be performed and the manner in which they are performed. The research plan is the proposal (see paragraph 1.6) as reviewed and accepted by the customer with any

negotiated changes or additions to the proposal (which are included in the ATP), plus the items defined in section 3.5 of this document.

For in-house research not initiated by a proposal, the lead researcher on such an activity is defined as the PI. PIs shall establish a research plan in collaboration with their supervisor or the research sponsor. It will contain brief statements of objectives, deliverables, schedule, and resource requirements plus the items defined in section 3.5 of this document.

1.9 Research Project. A research project is a significant research activity designated by a program and characterized as having defined goals, objectives, requirements, life-cycle costs, a beginning, and an end. A research project has sufficient complexity to require a project manager, project scientist, or systems engineer. Research projects are not covered by this document.

1.10 Validation. Validation is confirmation by examination and provision of objective evidence that particular requirements for a specific use of a product are fulfilled.

1.11 Verification. Verification is confirmation by examination and provision of objective evidence that specified requirements of activity output have been fulfilled.

1.12 Quality Record. Quality records are those documents that are maintained to demonstrate both MSFC conformance to specified requirements and the effective operation of the MSFC system.

2. RESPONSIBILITIES

2.1 The Principal Investigator is the person responsible for the management and technical (scientific or engineering) integrity of the output of a research activity.

2.2 Researchers are responsible for performing the research according to the directions of the PI.

2.3 The supervisor is responsible for ensuring that the research activity has been performed according to the plan and that all requirements have been met, prior to close out of the research activity.

3. PROCEDURE

The following actions are intended to establish the procedures necessary to ensure that the products of a research activity meet all specified requirements. They are intended to be generic in nature, recognizing the wide variety of research activities covered by this document. In many cases the customer will define those reviews and validations required to meet his needs.

Actionee		Action
	3.1	**Proposal Acceptance**
PI	3.1.1	Receives notification from the customer that the proposal to perform a research activity was accepted.
	3.2	**Develop ATP**
PI	3.2.1	Negotiates changes to the research activity that deviate from the submitted proposal. The changes are incorporated into the ATP.
PI	3.2.2	Ensures that the ATP is received and includes appropriate resources to perform the proposed activity.
PI	3.2.3	Notifies appropriate Center proposal tracking personnel of acceptance of the proposal.
	3.3	**Activity or Project Notification**
PI	3.3.1	Notifies supervisor and members of proposed research team that a research activity proposal has been accepted.
	3.4	**Research Activity Initiated**
PI	3.4.1	Initiates research activity per ATP and proposal.
	3.5	**Develop Research Plan**

PI	3.5.1	Incorporates the ATP and proposal (by reference when the proposal document is multi-volume) into a research plan, or at a minimum, utilizes the ATP and proposal as the basis for the research plan. The requirements of 3.5.2 and 3.5.3, below, are also addressed in the research plan.
PI	3.5.2	Defines the calibration requirements for test equipment used in the research activity per MPG 8730.5.
PI	3.5.3	Maintains appropriate documents (as defined in section 4 and negotiated with the customer) as quality records.
	3.6	**Perform Research Activity**
PI and Researchers	3.6.1	Perform the research per the research plan.
PI and Researchers	3.6.2	Maintain primary research records (e.g., log book, journal, forms, data base, etc.) to document information deemed worthy of being recorded. Such records shall be sufficient to allow their use (if required) to establish research primacy, patent documentation, and/or to allow independent duplication of the research findings. This information may include: activity goals/objectives, processes or procedures employed, and results/data recorded during/following activity performance. Backups of electronic logs (if used) shall be done on a regular basis.
PI and Researchers	3.6.3	Responsible for monitoring the performance of instruments and test equipment and ensuring that proper maintenance and calibration is performed as appropriate for the level of task being performed. The PI is responsible for defining the test equipment calibration requirements of his/her research consistent with MPG

		8730.5. The PI shall define equipment calibration requirements in his/her Research Plan. Once the PI defines the calibration requirements for his research, such calibration shall be managed per MPG 8730.5.
PI and Researchers	3.6.4	All research shall be conducted in a safe manner according to approved MSFC guidelines and procedures. The PI is responsible for identification and mitigation of safety hazards in his/her research areas. All hazardous materials shall be stored, handled, and disposed of safely and in accordance with approved MSFC guidelines and procedures. Material Safety Data Sheets (MSDS) are required for all hazardous materials in use. These MSDSs must be readily accessible and their location clearly marked.
PI and Researchers	3.6.5	The researcher whose primary research is computational is encouraged to follow good software development practices, such as using well-structured programming techniques, documenting the code algorithms by providing adequate comments in the source code, and/or writing a short users' guide to describe how to run the software. Configuration control of software shall be employed at the PI's discretion when appropriate.
PI and Researchers	3.6.6	Document the output of the research activity in terms that can demonstrate that the output: a) meets all requirements, and b) fulfills defined user needs. Requirements and defined user needs are given in the ATP, proposal, and research plan.
	3.7	**Validation, Verification and Reviews**

PI and Researchers	3.7.1	The researcher shall take steps to understand systematic errors and eliminate them as much as possible. As good data are useless with incorrect interpretations, the researcher is responsible for ensuring that the model used is appropriate and for checking if results are consistent with other interpretations.
PI and Researchers	3.7.2	Researchers performing computational research shall take adequate measures to validate the numerical results generated by their mathematical models. This may be done by any of the following methods: performing analyses of problems with known (closed form) solutions, benchmarking numerical results of the problem with those generated by other software that has similar capabilities, or comparison of numerical results with experimental results.
PI and Researchers, Supervisor	3.7.3	The PI shall perform verification at appropriate stages of the activity to ensure that the research output meets the requirements of the customer. Verification may be satisfied in whole or in part by the review process defined in the proposal or research plan. As a minimum, the PI and his research team shall hold one review with the PI's supervisor prior to submitting the final report or product to the customer. The supervisor will review the research results to ensure that the requirements of the research plan have been fulfilled. Records of all reviews shall be maintained as quality records (reference section 4).
PI and Researchers	3.7.4	The researcher is responsible for reporting the quality of the data. For quantitative results, this normally

entails reporting experimental uncertainties and confidence limits. This may also include a statement of assumptions within a range of conditions over which these assumptions are expected to hold. Anomalies should be addressed and documented in the laboratory notebook or other data record. Anomalous results that are not accounted for by a known problem should be included as part of the final data.

3.8 Quality Records Disposition

PI and Researchers — 3.8.1 Quality records shall be defined, maintained, and dispositioned according to section 4 of this procedure.

3.9 Output to Customer

Principal Investigator — 3.9.1 The PI shall provide to the customer the research output agreed to in the proposal.

4. RECORDS

The following quality records are defined by this document and shall be maintained per NPG 1441.1, “NASA Records Retention Schedules,” and MPG 1440.2, “MSFC Records Management Program:” the proposal (upon acceptance by the customer); the ATP (as defined in section 1.4); the research plan (as defined in section 1.5); primary research records, (as defined in 1.3); and formal review results. Other quality records may be defined by the PI for a particular research activity either in the proposal or during negotiation with the customer at the start of the activity.

4.1 Proposal. The proposal is maintained by the PI for the life of the activity plus 2 years at which time it can be destroyed or made a historical record as decided by the PI.

4.2 Authority to Proceed (ATP). ATP documentation is defined in section 1.4. The ATP will be maintained for the life of the activity plus 2 years at which time it can be destroyed or made a historical record as decided by the PI.

4.3 Research Plan. The Research Plan is defined in section 1.5. The Research Plan will be maintained for the life of the activity plus 2 years at which time it can be destroyed or made a historical record as decided by the PI.

4.4 Primary Research Records. These are defined in section 1.3. Lab notebooks are retained per Schedule 8/21, and experimental data files are maintained per Schedule 8/17 of NPG 1441.1. Other primary research records are retained for the life of the research activity plus 2 years. These records are maintained by the PI.

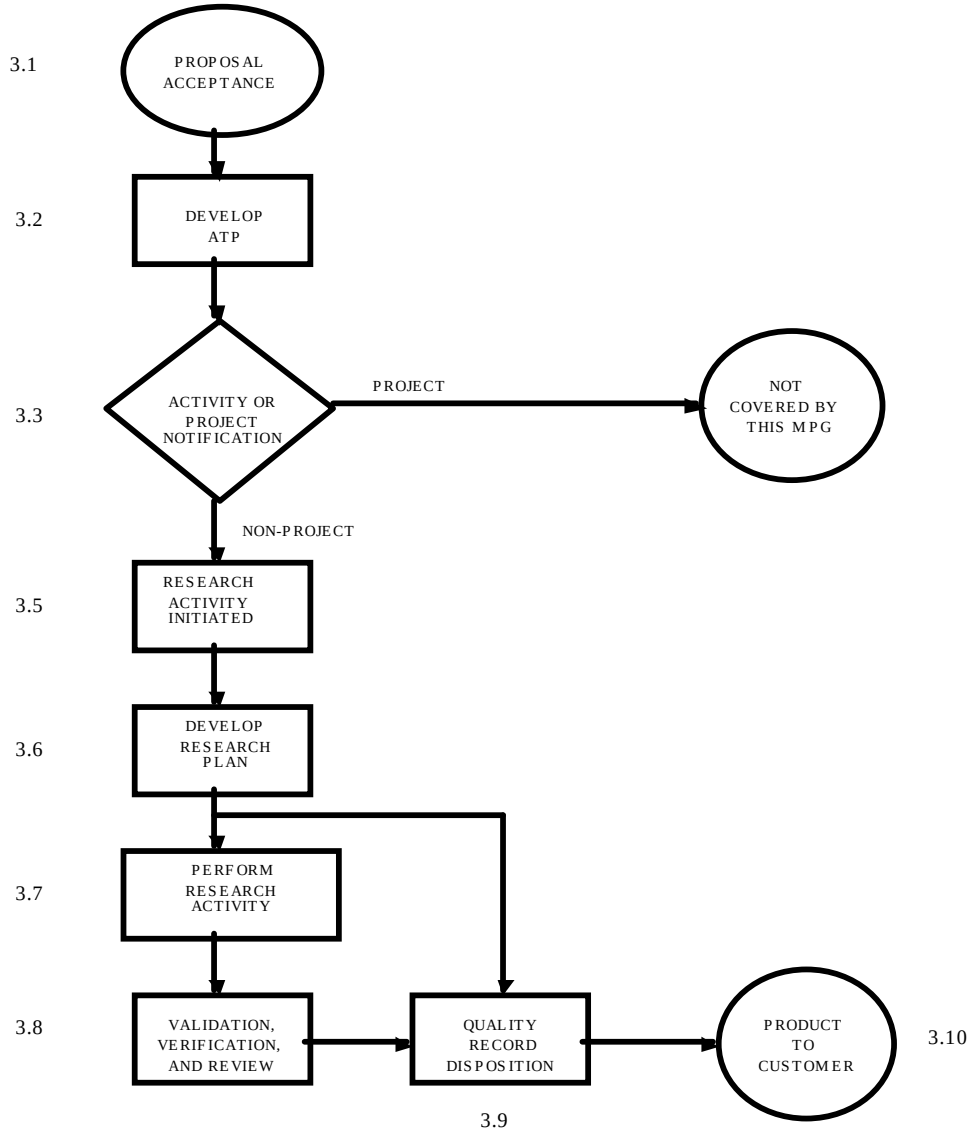
4.5 Reviews. The results of all reviews are maintained by the PI for the life of the activity plus 2 years at which time they can be destroyed or made historical records as decided by the PI.

4.6 Other. Other quality records may be defined for a particular research activity in the proposal or in negotiation with the customer at the start of the activity. These records will be maintained by the PI.

All quality records will be maintained by the PI for the duration of the research activity plus 2 years. After that they will either become historical records or archived as required by NPG 1441.1. Those records maintained locally shall be maintained by the PI's Department.

5. FLOW DIAGRAM

See Figure 1.



Research Activity Flowchart – Figure 1